



REMR MATERIAL DATA SHEET CM-CR-1.5

 EPOXY RESIN SYSTEM FOR DORMANT CRACK REPAIR
 AND SURFACE SEALER: DELTA AS69-9046
 UNDERWATER BONDING ADHESIVE

1. NAME

Delta AS69-9046
Underwater Bonding Adhesive

2. MANUFACTURER

Delta Plastics Company
7449 Avenue 301
Visalia, California 93291
Telephone: 209-851-2034

3. DESCRIPTION

Delta AS69-9046 A&B System is a medium viscosity, 1:1 mixing ratio by volume, medium pot life and medium gel time material developed specifically for use in making underwater repairs of masonry materials. The resin-hardener mixture will cure under fresh or salt water and will bond to clean wet surfaces. This system cures to a rigid tough adhesive with excellent bond strengths to masonry surfaces and to many other types of material surfaces including polystyrene foam. Other unique features of this system are that it will cure at low temperatures (40°F) and the cured system has excellent chemical resistance.

4. APPLICABLE SPECIFICATION

Specification of ASTM C 881-78, "Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete," generally apply.

5. USES AND LIMITATIONS

Uses: This system is suggested for use in underwater applications for the repair of cracks in masonry materials, the adhesive bonding of concrete, plastics, metals, ceramics, etc., to masonry surfaces, and the coating of the same type of materials underwater. This system has been successfully used to repair cracked concrete underwater. The material was pumped, under pressure, by in-head mixing equipment and injected through a nipple located at the bottom of the crack. The water in the crack was displaced as the epoxy adhesive filled the crack.

Limitations: A guide to the gel times and cure times at various temperatures for a 200 gram mass is as follows:

<u>Temperature</u>	<u>Gel Time</u>	<u>Full Cure Time</u>
50°F	33 to 40 min	7 days
70°F	17 to 23 min	5 days

Mix only the amount of material at one time that can be used within the times and temperatures given. Less mixed material will increase the times shown, while larger batches will decrease the times shown. The addition of sand or other similar types of aggregate to the resin-hardener mixture will also increase the times shown.

6. MANUFACTURER'S TECHNICAL DATA

<u>Property</u>	<u>Value</u>
Part A, color	Slight amber
Part B, color	Slight amber
Mixed, color	Slight amber
Solids content, percent	100
Mixed viscosity, cps	4,000
Gel time, 200 gm mass, 70°F	20 min
Hardness, short	D-68
Tensile strength, psi	7,800
Tensile elongation, percent	12
Compressive strength, psi	16,900
Flexural strength, psi	15,800
Flexural modulus of elasticity, psi (1×10^6)	0.51
Coefficient of linear thermal expansion (in./in./C)	54×10^{-6}
Slant shear bond strengths (cure 7 days @ 77°F)	

<u>Material</u>	<u>Cured Under Water</u>	<u>Cured in Air</u>
Concrete to concrete*	Concrete fractures	Concrete fractures
Steel to concrete*	Concrete fractures	Concrete fractures
Steel to steel**	2,450	2,900
Creosoted wood to creosoted wood**	Wood fractures	Wood fractures
Aluminum to aluminum**	2,200	2,600

* Direct shear
** ASTM D 1002

7. MANUFACTURER'S GUIDANCE FOR APPLICATION

Surface Preparation:

The surfaces to be bonded must be clean. Plant or animal life, slime, oxides, laitance, etc., must be removed. Grit blasting or ultra high

pressure water blasting may be the only effective methods of cleaning some structures.

Mixture Proportioning: The ratio of resin and hardener must be accurate.

Part A	95 parts by weight or 1 part by volume
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Part B 80 parts by weight or
 1 part by volume

The adhesive components are medium-viscosity materials, and thorough mixing in air before using is essential. Keep air entrapment to a minimum.

Application: After mixing the adhesive thoroughly in air, make the repair underwater.

The curing process starts when the adhesive is mixed. Low temperatures lengthen the gel time and thus increase the risk that the adhesive may wash away. Therefore, in cold weather and in flowing water, it may

be helpful to apply the mixed adhesive to a backing material such as fiberglass, polyethylene, etc., prior to going underwater. The repair can then be made by applying the adhesive-coated backing material to the area.

Precautions: Always wear protective clothing and practice cleanliness when working with epoxy resins and hardeners. If skin contact is made, wash the area with soap and water. If the materials get into the eyes, rinse with quantities of water and consult a physician. Use epoxy resins and hardeners only in well-ventilated areas, and avoid breathing vapors.

8. CORPS OF ENGINEERS' EVALUATION

Technical data:

<u>Performance Properties at 73°F</u>	<u>Test Method</u>	<u>Results</u>
Viscosity, cp	ASTM D 2393	3,950
Gel time, min	ASTM C 881	27.5
Nonvolatile content, percent	ASTM D 1259	96.5
Bond to concrete, psi	ASTM C 882	4,170 concrete failure
Effect of moisture on bond strength, psi	ASTM C 882	4,080 concrete failure
Compressive strength, psi	ASTM D 695	16,100
Young's modulus of elasticity, psi	ASTM D 695	4.23×10^5
Tensile strength, psi	ASTM D 638	7,890
Tensile elongation, percent	ASTM D 638	11.3
Flexural strength, psi	ASTM D 790	15,100
Shrinkage volumetric, percent		3.8
Hardness	ASTM D 2240	80
Water absorption, percent	ASTM D 570	0.33

9. ENVIRONMENTAL CONSIDERATIONS

Reasonable caution should guide the preparation, repair, and cleanup phases of activities involving potentially hazardous and toxic chemical substances. Manufacturer's recommendations to protect occupational health and environmental quality should be carefully followed. Material safety data sheets should be obtained from the manufacturers of such materials. In cases where the effects of a chemical substance on occupational health or environmental quality are unknown, chemical substances should be treated as potentially hazardous toxic materials.

10. AVAILABILITY AND COSTS

Availability: The Delta AS69-9046 A&B System and the AS69-46 System are available in the following standard kit sizes packaged by weight:

	<u>10-Gal Kit</u>	<u>2-Gal Kit</u>	<u>2-Qt Kit</u>	<u>1-Qt Kit</u>
Part A, weight	47.5 lb	8.5 lb	2.375 lb	1.2 lb
	<u>10-Gal Kit</u>	<u>2-Gal Kit</u>	<u>2-Qt Kit</u>	<u>1-Qt Kit</u>
Part B, weight	40 lb	8 lb	2 lb	1 lb

The material can be purchased at distributors throughout the U.S.A.

Costs: Delta AS69-9046 costs approximately \$100 per 2-gal kit.

11. TECHNICAL SERVICES

The Delta Plastics Company facilities and help are available for specific problems.